motherglass substrate **100**, which can be a large sheet (e.g. 2×3 feet) from which a number of individual substrates can be generated. A chemical strengthening step can be performed on the top glass, which can involve applying a nitric acid bath at high heat to glass **100**, resulting in compressive forces or stresses in the surface layer of the glass and tensile stresses in the interior core of the glass that can make the surface of the glass less likely to crack apart. Anti-glare coating **102** can then be deposited on glass **100**. Anti-glare coating **102** can be particle-embedded silicon dioxide. Alternatively, anti-reflective (AR) coating, or a plain glass surface with no coating, can be used. Black mask **104** can be applied to border regions of glass **100**. Black mask **104** can be applied using printing techniques, roller coating, or sputtering followed by etching of unwanted areas. Alternatively the black mask can be applied using spin coating or extrusion coating of photo-imagable black polymer, and selectively removed with photolithography (similar to the process to create black mask for LCD color filters). Note that FIG. **1***a* shows that black mask **104** has been applied in a border region, but has been stripped away in a clear center region. Next, clear overcoat **106** can be applied over black mask **104** and glass **100**. Substantially clear overcoat **106** can be a clear polymer that can be curable with ultraviolet (UV) light. Substantially clear overcoat **106** can smooth over the step between the black mask and non-black mask areas, and can form a substantially planar surface for subsequent Indium Tin Oxide (ITO) sputtering and metal patterning. ITO **108** of 10 to 200 ohms per square (max) and an optical index of n=1.8 can then be sputtered over overcoat **106**, although thicker layers of ITO can reduce this resistance and thinner layers can increase this resistance. The center region can be masked to protect the transparent center region from subsequent metal sputtering by photo-imaging or printing photoresist **110** with an overlap of about 100 microns±50 microns with respect to black mask **104** using silkscreen techniques. Metal **112** having a resistivity of 0.2 ohms per square can then be sputtered over ITO **108** and photoresist **110**. Metal **112** can be a stack-up of different metals, such as aluminum (for high connectivity) and molybdenum (to prevent corrosion), copper, or a silver alloy.

[0017] FIG. **1***b* shows the step of removing photoresist **110** by peeling the photoresist off or submersing it into an acid that attacks the photoresist but not the metal. For each part, this step can form a metal ring around the transparent region of the touch screen.

[0018] FIG. **1***c* shows the patterning of metal **112** using photolithography that can form metal traces having 10 micron (minimum) widths and spaces along the borders of the touch screen, and then further patterning ITO **108** using photolithography to form row or column traces having 10 to 30 micron (minimum) widths and spaces. Border insulator **114** of 5 to 10 micron thickness can then be printed over ITO **108** to create a fluid-tight ring around each touch screen.

[0019] FIG. **1***d* illustrates an exemplary first lower layer subassembly according to embodiments of the invention. FIG. **1***d* shows bottom glass or motherglass substrate **116**, which can be a large sheet (e.g. 2×3 feet), and from which a number of individual substrates can be generated. Substantially clear overcoat **118** of silicon dioxide or polymer can then be applied over bottom glass **116** to prepare the surface for ITO. This overcoat can be optional. ITO **120** having a resistivity of 10 to 200 ohms per square and an optical index of 1.8 can then be sputtered over clear overcoat **118**. ITO **120** can then be patterned using photolithography. Spacers **122** of clear silicon ink having an optical index of 1.8, or an optical index substantially similar to the fluid that will be used, which provide a spacing between the top and bottom glass, can then be printed over ITO **120** and clear overcoat **118** and can be cured using ultraviolet (UV) light. In border areas (the left two spacers in FIG. **1***d*), the border spacers can be a solid pattern 12±2 microns in height, except for where via openings exist. In other areas, the spacers can be dots of 50±10 micron diameter 12±2 microns in height. If the touch screen is to include force sensing, spacers **122** can be made of a soft, elastic material such as clear, UV-cured silicon ink that has can have an optical index that matches that of ITO to minimize pattern visibility. If the touch screen does not include force sensing, the spacer dots can be made of a harder, inelastic material. Assembly adhesive **124** such as clear silicon ink having an optical index of 1.8 can then be printed onto spacer **122** using the same pattern as the spacers. Note that adhesive **124** is not immediately UV-cured so it can act as an adhesive. Conductive vias **126** having a diameter of 500 microns can then be deposited between the border spacers using a silk-screening process or a robot needle dispenser. Vias **126** can be made of conductive epoxy or ink and can provide electrical connections between the top and bottom glass. Vias **126** can allow the consolidation of all connections onto a single layer.

[0020] FIG. **1***e* shows the previously described first upper layer subassembly and the first lower layer subassembly bonded together with assembly adhesive **124** to form a first touch sensor panel assembly, with UV light **126** applied through the bottom glass to cure the assembly adhesive. A fluid-tight gap **199** is can be formed between the first upper layer subassembly and the first lower layer subassembly.

[0021] FIG. **1***f* shows the step of scribing, where laser or wheel **128** can be used to introduce stresses into the glass so that the motherglass can be broken into individual parts.

[0022] FIG. **1***g* shows the step of breaking away unwanted parts of the assembly at the scribe lines created by the stresses. The view shown is along the short edge of the exemplary first upper layer subassembly, as shown in the thumbnail. Note that the scribe lines are offset, so that when the unwanted parts are broken away, ledge **101** can be used for flex circuit connections.

[0023] FIG. **1***h* shows fluid-tight gaps **199** between the first upper and lower layer subassemblies that can be filled with clear optical fluid **130** having an optical index that can be similar to that of the ITO **120** and spacers **122** to make the ITO patterns and spacers substantially transparent. If force-sensing is not required, fluid **130** could instead be a liquid glue that can be curable with UV light to make a solid stackup. Fluid **130** can have dielectric properties which enable the row and column traces that can be formed in ITO layers **120** and **108** to experience a mutual capacitance between them at cross-over points and act as touch sensors. If force-sensing is employed, the change in the distance between ITO layers **120** and **108** during a touch can change the mutual capacitance experienced by each of the touch sensors, effectively representing a measure of force. IC **132**, which can have a height of 0.35 and a width of 1.5, can then be bonded to metal traces **112** on the top glass using anisotropic conductive film (ACF) **134**. Flexible printed circuit (FPC) **136** (e.g. a 2-layer FPC) can also be bonded to metal traces **112** on the top glass using ACF **138**.

[0024] Because the use of PSA to fully laminate the exemplary first upper and lower layer subassemblies together can cause bubbles to form in the PSA, thereby reducing the clarity